P. R. Reitz (ed.), *Flora Ilustrada Catarinense, I Parte. Pteridáceas,* 244 pp. 1972), or in Peña-Chocarro *et al.* (Fern Gaz. 15:221–259. 1999).

Adiantopsis* ×*australopedata Hickey, Barker, et Ponce, *hybr. nov.* **Fig. 1**. A & B. Type.—Paraguay, Depto. Cordillera, Caacupe, semideciduous forest to 20 m tall on fairly steep slope, *Enterolobium*, *Parapiptadenia* dominants, soil sandy with some red clay, 25° 20′ S, 57° 10′ W, 9 Feb 1984, *Hahn 2013* (holotype MO, sheets 1 and 2; isotype UC).

Laminae pedatae; pinnae supernae bipinnatae; pinnae basales tripinnatae, praebens pinnulas basales basiscopicas elongatas magnopere. Ab *A. pedata* sporis abortivus differt.

PARATYPES.—**Brazil**: Rio Grande do Sul, transiens in *Ad. pedata*, Cameste do Peiraes, 1907, *Jürgens 173a* (UC). **Paraguay**: in altplnitie et declivibus "Sierra de Amambay", May 1907/1908, *Rojas 10451* (BM); Colonia Indepencia Villarica, 13.11.1945, *Teague 453* (BM). **Argentina**: Misiones, Dep. Iguazú, Parque Nacional Iguazu, *Hickey 01-63, Taylor, Strittmatter & Guaglianone* (MU). Dep. Cainguás, Predio de la Universidad Nacional de La PLata, valle de arroyo Cuña Pirú, 2do. campo con "Urunday", 27° 07′ S–54° 58′ W, sotobosque, *Biganzoli, Peralta, Giallorenzo & Moreno 168* (SI).

The authors are indebted to Lara Strittmatter and Rosa Guaglianone for trip arrangements and field assistance. We also thank the Parque Nacionales Administration for allowing botanical collections at Iguazú Falls, and acknowledge the financial support of the W. S. Turrell Herbarium (MU). This work represents a portion of a Master's project on *Adiantopsis* being conducted by Michael Barker at Miami University.—R. JAMES HICKEY, MICHAEL S. BARKER, Botany Dept. Miami University, Oxford, OH 45056 U.S.A.; MÓNICA PONCE, Instituto de Botánica Darwinion, Labardén 200, B1642HYD San Isidro, Argentina.

Leaf Flavonoids in the Genus *Gleichenia* (Gleicheniaceae).—As part of a continuing chemotaxonomic study of flavonoids in genera of the Gleicheniaceae by Umi Kalsom (Blumea 40: 211–215. 1995), our attention has turned to *Gleichenia*, which contains some five species and two varieties. Apart from the genus *Dicranopteris*, the family has not been extensively investigated and the results of a general flavonoid survey will be presented later. This paper describes the identification of some of the major flavonoids found in the genus *Gleichenia*. From the viewpoint of flavonoid chemistry, the only major survey of *Gleichenia* has been that of Wallace *et al.* (Amer. J. Bot. 70: 207–211. 1983) who found flavonol 3-*O*-glycosides to be major components in methanolic leaf extracts of 8 species. In addition, some species appear to accumulate traces of chalcone *O*-glycosides and/or aurone *O*-glycosides.

The purpose of the present research was to determine whether or not other members of the Gleicheniaceae have flavonoid profiles similar to the

gleicheniaceous ferns previously studied. For this, the flavonoid profiles of *Gleichenia hirta* Bl., *G. microphylla* R. Br., *G. longissima* Bl. and *G. blotiana* C. Chr. as interpreted by Piggot (*Ferns of Malaysia in Colour,* Tropical Press, Sdn Bhd., Kuala Lumpur, 1998) were determined and compared with those of *Gleichenia* by Wallace and Markham (Amer. J. Bot. 65: 965–969 1978). Leaves from freshly dried plant material collected from various habitats in Peninsular Malaysia were analysed. Voucher specimens of the ferns (collection number: UKY 326-329) have been deposited in the herbarium of the Department of Biology of the Universiti Putra Malaysia. Standard chromatographic procedures (Harborne, J. B. 1967, *Comparative Biochemistry of the Flavonoids,* Academic Press, London; Markham, K. R. 1982, *Techniques of flavonoid Identification,* Academic Press, London) were used for examining flavonoids present in direct and acid hydrolysed leaf extracts; the common aglycones were identified by means of R_f values and color reaction in UV light when compared with standard markers. In acid-hydrolyzed extracts, the flavones were recognized by their distinct, dark yellow spots on paper chromatograms in UV light. When fumed with ammonia vapor they became bright yellow. The flavonols appeared yellow in UV light before and after fuming with ammonia. For complete identification of flavonoid glycosides, samples were separated in one-dimensional chromatograms of direct extracts and then the pure flavonoids were identified by UV spectral analysis using standard procedures of Mabry and coworkers (*The Systematic Identification of the Flavonoids,* Springer-Verlag, New York, 1970). In addition to spectral techniques, flavonoids were identified by PC (Whatman No. 1) co-chromatography of the glycosides and products of enzyme and acid hydrolyses in η-butanol-acetic acid-water (BAW, 4:1:5) and 50% glacial acetic acid (50% HOAc). The aglycones were identified by TLC (Merck) co-chromatography in BAW, forestal (concentrated hydrochloric acid-acetic acid-water, 3:30:10) and 30% HOAc, whereas the sugars were identified by PC co-chromatography in BAW, *h*-butanol-ethanol-water (BEW, 4:1:2.2) and toluene-η-butanol-pyridine-water (TBPW, 5:1:3:3).

Twelve compounds were obtained in a more or less pure state by means of preparative chromatography. All species produce kaempferol and quercetin, while genkwanin and luteolin were present in *G. blotiana* C. Chr. and *G. hirta* Bl. and acacetin in *G. microphylla* R. Br. This is the first report of acacetin and genkwanin in *Gleihenia*. Acacetin was isolated as the 7-glucoside. The flavonols of *Gleichenia* leaves were found to be present as 3-glucosides, 3-rhamnoside, 3-rutinoside, 3,4′-diglucosides, 7-glucosides and 7-arabinoside. Quercetin-3-glucoside was identified as a major flavonoid component of all species studied. Quercetin-3-rhamnoside and quercetin-3,4′-diglucoside were isolated from *G. longissima* and *G. blotiana*. In addition, *G. blotiana* accumulates kaempferol-3-methyl ether-7-arabinoside, rhamnocitrin-3-glucoside and kaempferide-7-arabinoside. Kaempferol-3-rutinoside and kaempferol-7-glucoside were found in all species except *G. hirta*, which does not appear to accumulate the kaempferol derivative. The glucosides were observed as minor constituents. Two compounds which are generally rare in ferns, orientin and

vitexin, occur in *G. microphylla*. Previously, Wallace and coworkers (Amer. J. Bot. 70:207–211. 1983) studied the species of *Gleichenia* from Hawaii and found different flavonoid patterns. They found quercetin-3-rutinoside, quercetin-3-glucoside and kaempferol-3-glucoside, but they found kaempferol-3-rutinoside as well. Furthermore, quercetin-3-rutinoside was identified as a major flavonoid component of all species except *G. intermedia*, *Dicranopteris pectinata* and *Sticherus cunninghamii* (it was a minor component in the latter). Quercetin-3-glucoside and kaempferol-3-glucoside were observed as minor constituents of the two species studied. Thus, our findings are not consistent with the flavonoid profiles of the species analyzed by Wallace and co-workers (Amer. J. Bot. 70:207–211. 1983). From a chemotaxonomic viewpoint, the occurrence of kaempferol and quercetin in all species indicates a close relationship among them. However, the presence of acacetin-7-glucoside, vitexin and orientin in *G. microphylla* is of interest, since these compounds have not been found in this family before.

The authors thank Universiti Putra Malaysia for financial support.—UMIKALSOM YUSUF, Department of Biology, Universiti Putra Malaysia, Serdang, 43400, Malaysia, KHAIRUDDIN ITAM, Institute of Bioscience, University of Malaya, 50603, Kuala Lumpur, FARIDAH ABDULLAH, IZANA ZAINAL, Department of Biology, Universiti Putra Malaysia, Serdang, 43400, Malaysia and MOHD. ASPOLLAH SUKARI, Department of Chemistry, Universiti Putra Malaysia, Serdang, 43400, Malaysia.